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ABSTRACT

This study was designed as a systematic investigation of the feasibility and effectiveness of student authored videodisc presentations in a non-major introductory level college biology course. Students (n=66) used a quick-learn authoring system, the Macintosh computer, and videodisc player with color monitor. Results included: (1) students managed the system effectively and produced lessons averaging 14.6 minutes long; (2) performance on a test covering videodisc lessons showed no differences between those in the student authored classes compared with those who observed teacher authored videodisc presentations; (3) students showed positive attitude toward the project despite the fact that it took them 12-15 hours to prepare the videodisc presentations; and (4) success does not appear to be correlated with previous computer experience or mathematical ability. Demonstration videodisc lessons on microscopy, the protist kingdom, and interaction of organisms are included. A bibliography of 70 references is included. (KR)

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Integrating Computer Interfaced Videodisc Systems in Introductory College Biology

Paper presented at
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April 8-11, 1990

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Integrating Computer Interfaced Videodisc Systems in Introductory College Biology

This study was designed as a systematic investigation of the feasibility and effectiveness of student authored videodisc presentations in a non-major introductory level college biology course. Students used an easy-to-learn authoring system, the Macintosh computer and videodisc player with color monitor.

Sixty-six students were divided into three lab sections, two of which were designated experimental and one served as the control. No significant differences were found between the SAT scores for the lab groups. The experimental group formed working groups of three to view one demonstration lesson, develop one 15-minute presentation and view eight peer-produced lessons. The control group viewed nine instructor prepared videodisc lessons on the same topics. Students were tested for content acquisition and attitudinal changes.

Student authors were given complete freedom in deciding what videodisc material to include in their presentation. Despite this freedom, the mean scores on a criterion referenced test of students in the experimental group did not differ significantly from the control group. The experimental group exhibited a positive response to the assignment and suggested (nearly 2:1) that the assignment be included in future courses. Although working in groups, most students reported they assumed three roles (researcher, programmer and presenter). Instructors and the student assistant all consider the method one that should be used again. Several independent variables (age, locus of control orientation, math SAT score, number of biology courses and computer experience) were tested for influence on the postest scores and no significant effects were found.

Integrating Computer Interfaced Videodisc Systems in Introductory College Biology

PURPOSE

Many studies have been done on the effectiveness of the videodisc as a delivery system compared to traditional delivery systems (Bosco, 1986). This study designed and tested a model for the integration of the computer-interfaced videodisc player in the teaching of introductory level biology classes. It includes an investigation of the student as programmer, designer, and presenter of biological information on an assigned topic that includes visual data accessed from videodisc. The focus is on the student as active participant in the use of the technology in addition to the effectiveness of the technology. Because of the uniqueness of the assignment and the somewhat complicated nature of the instrumentation, the students authoring and presenting lessons worked in cooperative groups as defined by Johnson, et al. (1986)

As a result of a review of appropriate literature, the design of the experiment included recognition that several factors (student background, scholastic ability, level of cognitive development, locus of control orientation and ability to control the medium) may affect the successful use of the computer and videodisc system by students and the cognitive and affective consequences.

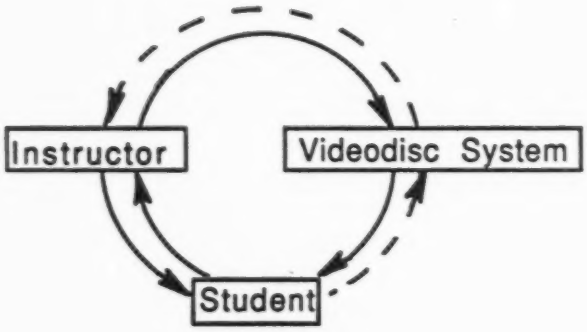
Specifically, this study investigated the following:

- Is it feasible for students, working in small groups, to learn an authoring system, research a topic in biology and produce a videodisc lesson for viewing by other members of the class?
- Do college students learn biological information as well from a computer/videodisc system by actively participating in the production of a lesson as they do by observing a lesson prepared and delivered by an instructor?

- Do students demonstrate a more favorable attitude toward learning biology as a result of their active participation in the lesson development and delivery?

The dialogue between instructor and student is traditionally mediated by the exchange of spoken and written material. The interactive videodisc system has the potential to become part of this two way medium of communication. This study was designed to test the hypothesis that students are capable of managing the system and communicating information to the instructor and other students in the form of videodisc presentations. A scheme representing this flow of information is depicted in Figure 1 where the solid lines represent existing channels for the flow of information, including reciprocal arrows representing dialogue accomplished by written and oral work and one ring of arrows representing instructor control of videodisc equipment. The dashed arrows represent the questions addressed in this study.

Figure 1
Flow of Information



Existing instructor/student dialogue is represented by the reciprocal solid lines between them; Instructor-controlled videodisc presentations are represented by the solid clockwise lines, and the potential flow achieved by student authoring of videodisc presentations by the dashed lines.

RESEARCH DESIGN

The model tested in this study was implemented in the laboratory setting. One laboratory section (Wednesday) served as the control group while the other two labs

(Monday and Tuesday) served as experimental groups. The design was quasi-experimental in that students were not assigned randomly to a section. Students signed-up for the lab that fit into their schedule with no knowledge of the study to be conducted. The three groups were compared using SAT scores and their GALT (Group Assessment of Logical Thinking) scores to ensure comparability. No significant differences were found. The labs were coordinated in that the instructors attempted to teach material in a similar manner and cover the same topics. Students in all labs followed the same schedule, heard the same lectures, and were graded using the same system. One major experience served as the difference between the control and the experimental laboratories, that difference being student use of the computer/ videodisc equipment.

Figure 2
Schematic Summarizing Experimental Design

3 Lectures per week		
Lab 1: Monday 2-5 pm	Lab 2: Tuesday 2-5 pm	Lab 3: Wednesday 2-5 pm
Instructor A	Instructor B	Instructor A
Videodisc Presentation	Videodisc Presentation	Oral Report
Student Assistant		

In the control lab, i.e., Wednesday, the videodisc presentations were entirely researcher-designed and teacher-controlled . The lessons were constructed using the fundamental step-by-step process suggested by Gagné, et al.(1981) for the development of CAI but, in addition, relevant visual material was included from the videodiscs. The videodisc presentations were entirely student-designed and student-controlled in the experimental labs (Monday and Tuesday labs) with the exception of the first videodisc presentation on Microscopy. The videodisc lesson on Microscopy was designed and presented by the researcher in all three labs. In the Monday and Tuesday lab section, however, the researcher explained to the students how the program was constructed. They

were given written guidelines about their assignment at that time, directions on how to use the equipment and the authoring system, and a copy of the Microscopy program as a model. Students had the opportunity to select a topic from the course syllabus and to select the teams of three to work on their presentations.

As a means of controlling for the group experience inherent in the design, students in the control lab were given one group assignment. That is, they were expected to write and present an oral and written group laboratory or research report, with each student in the group receiving the same grade. Each student in the control lab participated in one group project of this type once in the semester. Each student in the experimental lab participated in one videodisc group presentation in the semester. They, too, received a 'group' grade.

The Control Lab Treatment

Students in this lab viewed nine lessons with supplemental videodisc visual information that the researcher developed and the instructor presented. The first videodisc presentation covered Microscopy. The other topics were: DNA and Proteins, Monerans and Protists, The Fungi, Plant Diversity, Animal Embryonic Development, Behavioral Adaptations, Evolution of Animals, Interaction of Organisms. These topics were chosen because they are well supported by the videodisc content.

The method of instruction used in this lab is the traditional teaching mode–information delivered by the instructor–supplemented with visual information from the videodiscs. The visual material was presented in much the same way that slides and movies have been used in the past. These students were passive recipients of the information. Students in this lab were assigned one group assignment. They prepared (as part of a group of three students) one graded lab/research report with both a written and oral component.

The Experimental Labs Treatment

Students in the experimental groups (Labs 1 and 2) worked in groups of three and produced one presentation on an assigned topic. They viewed one videodisc presentation on Microscopy which was designed and presented by the researcher. This lesson served two

purposes in these labs: first, it contained information about light and electron microscopy identical to the presentation given to the control group and secondly, it served as a model program and introduction to the process of designing a presentation and using the authoring language. Eight groups of students organized lessons on the same topics as those presented to the control lab. Students signed up for a topic which they chose from the lab syllabus. Students in these labs served as 'producers' and 'designers' in their own group and 'observers' of the other student-group projects. They were 'active participants' for one presentation and 'passive recipients' while viewing the seven other student presentations. In order to facilitate students' first use of the system, they were told to make an appointment with the student laboratory assistant. This student, with interest and skill in both biology and computer applications, met with each group at least once in the computing center where a station had been set up for their use. She supported their initial use of the system and reported problems, successes and other observations to the researcher and instructors throughout the study. She also submitted intermittent written reports to the researcher.

DATA

Data were gathered from the following sources:

1. pretest and posttest scores on topically relevant multiple choice questions
2. a student background questionnaire including self-reported education and interest levels.
3. a measure of the cognitive level of the students (GALT)
4. student SAT scores
5. an indication of the students' locus of control using Levenson's IPC Scale
6. instructor background questionnaires
7. presentation evaluation forms completed by the instructors
8. project evaluation forms completed by students

9. oral and written reports from the student assistant

10. final individual interviews with the instructors

Analysis of variance was run using the pretest and posttest scores; chi square tests were used with the categorical data and stepwise multiple regression was used to determine which of the independent variables may have influenced the student performance on the posttest.

Conclusions

The first question investigated in this study, the feasibility question can clearly be answered in the affirmative. Students in the experimental groups successfully prepared and delivered lessons on biological topics including videodisc pictures and films.

The next question dealt with the cognitive domain as measured by biological content acquisition. In a criterion based test, the mean score of students who participated in the student authoring experience did not differ significantly from the mean score of students in the control group.

The third major question dealt with the affective domain. Analysis of questionnaires asking how students felt about different aspects of the assignments reveal, for the most part, a positive attitude toward using the videodisc system by those students who used it in this study. Students preparing videodisc preparations were more 'nervous' than their counterparts when they were first told about the assignment, yet they were more 'comfortable' with the assignment when asked how they would feel the next time. The majority recommend that the assignment be retained for future classes.

Age, locus of control orientation, math SAT score, number of biology courses and computer experience appeared to have no detectable effect on student performance. The single most important variable influencing the student performance on the posttest was the verbal score on the Scholastic Achievement Test.

Integrating Computer Interfaced Videodisc Systems in Introductory College Biology

An Investigation of the Feasibility and Effectiveness of Student Authorship and Presentation

Kathleen Ebert-Zawasky, Ed. D. and Gerald L. Abegg, Ph. D.

General Objectives

- develop and test a model incorporating the use of a computer interfaced videodisc system in the teaching of Introductory College Biology (non-majors)
- encourage active student participation in the authoring and presentation of videodisc lessons

Preparation

Prior to working on a videodisc project, students

1. viewed the demonstration lesson "Microscopy: Light and Electron"
2. received an explanation of the course map of the demonstration lesson and how that lesson was constructed
3. read a 7-page handout with instructions covering
   a. a description of the assignment
   b. instructions on how to operate the videodisc player
   c. instructions on how to use VideoBuilder
4. met with the student assistant at the work station

Benefits to the Students

Students may

1. browse extensive video and audio material
2. research a biological topic using conventional sources of information and the videodisc as database of visual information
3. develop in-depth knowledge of one topic
4. practice communicaiton of biological/technical information
5. perform a task requiring higher order thinking: organizing, evaluating and synthesizing information
6. work in a cooperative venture (groups of 3 students)
7. exercise logical thinking
8. learn control of the technology

Advantages of Using VideoBuilder

1. smaller memory requirement than HyperCard; no hard drive needed
2. visual – flowchart or map; invites 'building' of program
3. intuitive – consistent with other Macintosh applications
4. modular – each state is a discreet unit
5. reliable interface with the videodisc player
6. opportunity for 5 types of input
7. graphics and text tools available
8. branching easily programmed
9. expansion possibilities

Benefits to the Instructor

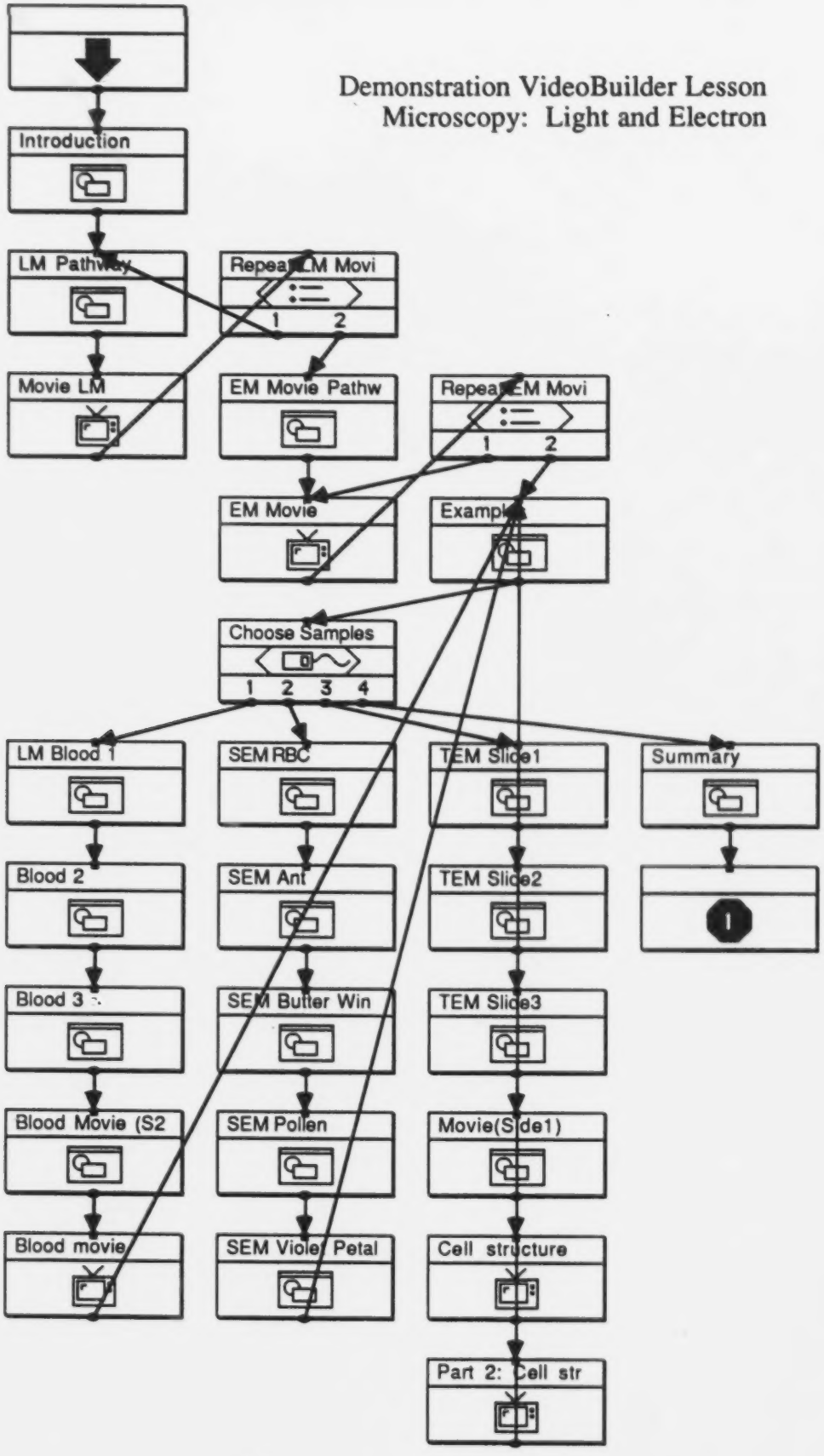
Instructors

1. will save time – constructing videodisc lessons can be time-consuming
2. may learn something new from student research or think of organizing information in new ways
3. may accumulate a library of lessons that may be used with future classes.

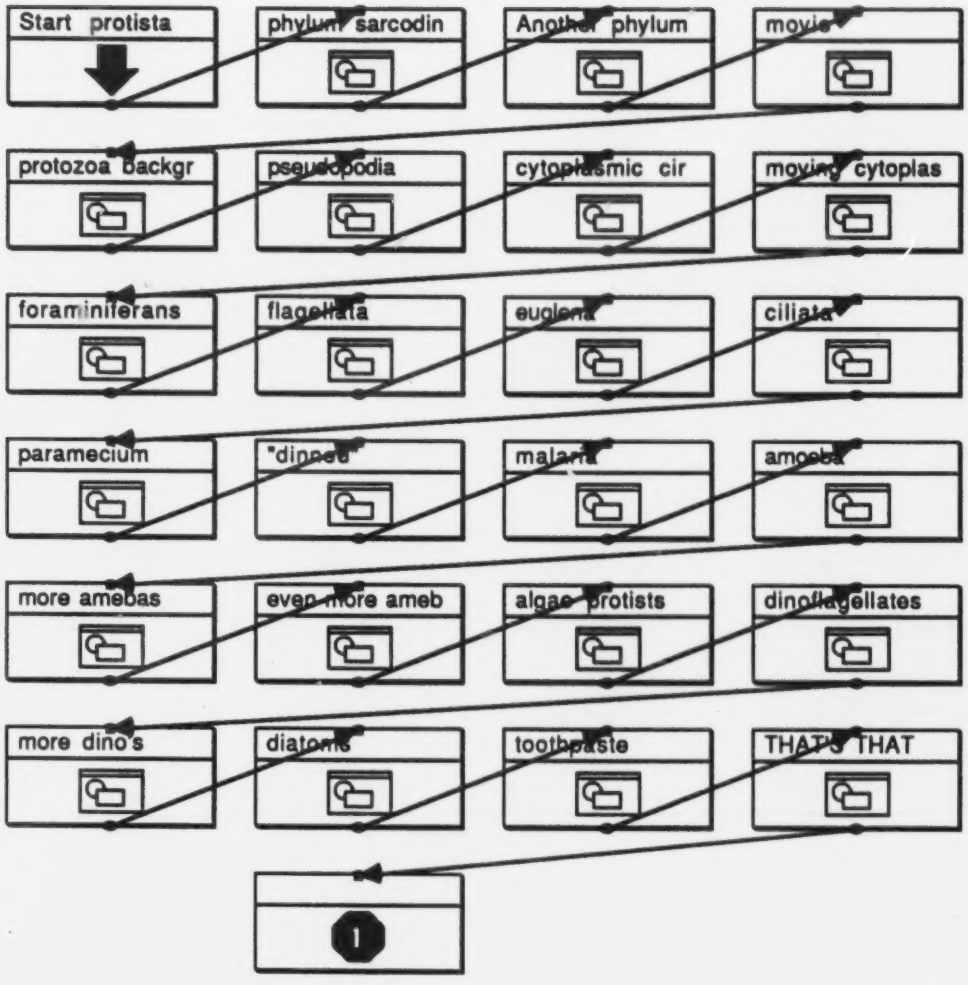
Results

1. Feasibility – Students managed the system effectively; produced lessons averaging 14.6 minutes long
2. Cognitive domain – Performance on a test covering videodisc lessons showed no differences between those in the student author classes compared and those who observed teacher authored videodisc presentations.
3. Affective domain – Students showed positive attitude toward the project despite the fact that it took them 12-15 hours to prepare the videodisc presentations
4. Other comments – Success does not appear to be correlated with previous computer experience or mathematical ability.

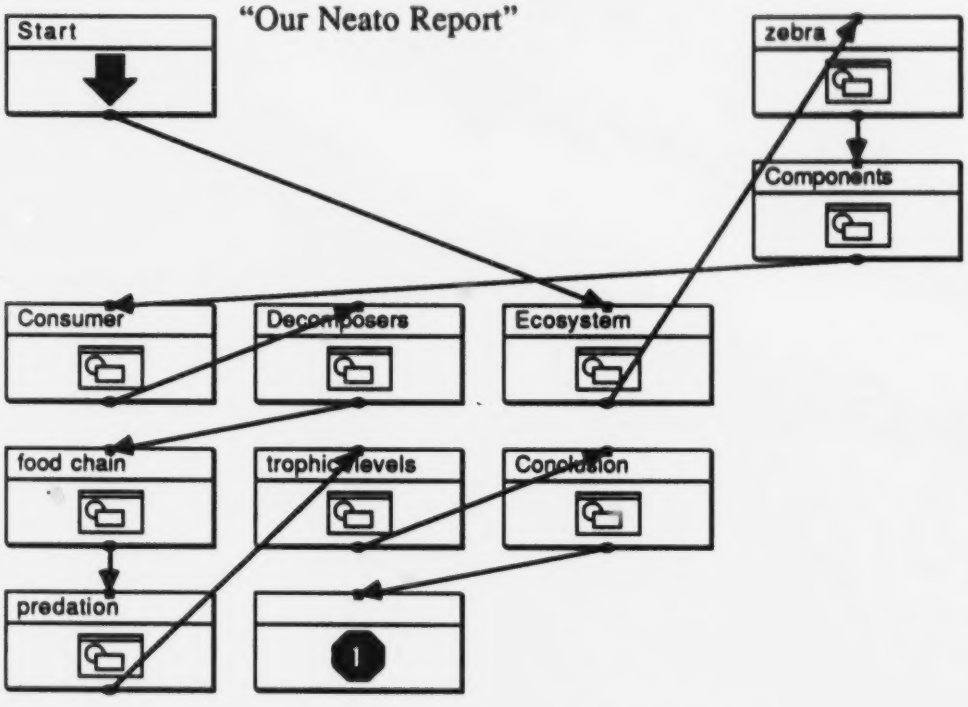
Demonstration VideoBuilder Lesson
Microscopy: Light and Electron



Student Program: The Protist Kingdom



Student Program: Interaction of Organisms



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